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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/590,011

08/21/2006

Takeshi Hikata

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EXAMINER

HORNING, JOEL G

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

07/09/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/590,011	Applicant(s) HIKATA, TAKESHI	
	Examiner JOEL G. HORNING	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 May 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) 8-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>08-21-2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Claims 8-15 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on May 29th, 2009.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1, 5 and 7** are rejected under 35 U.S.C. 102(e) as being anticipated by Delzeit (US 6858197) as evidenced by the dictionary.com definition of “wavelike” (retrieved on June 30th, 2009).

The instant claims are directed towards a catalyst structure, which can be used to make carbon nanotubes by vapor deposition, which includes a catalytic material which forms a ring or a whirl on a crystal growth surface.

Delzeit is directed towards a catalyst structure for depositing carbon nanotubes by a vapor deposition method, which includes a surface with a layer of catalyst material which is formed into a desired pattern (abstract), this pattern can be a whirl shape on a crystal growth surface (figure 2H, col 4, lines 31-42) (**claim 1**).

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3. Regarding **claim 5**, Delzeit teaches that the catalyst structure can be a multilayer catalyst material with a first layer of iron, cobalt, or nickel covered by a second layer of molybdenum (**claim 5**) (col 4, lines 57-62).
4. Regarding **claim 7**, according to dictionary.com “wavelike” is defined to mean “an outward curve, or one of a series of such curves, in a surface or line; undulation.” Thus a wavelike ring is a ring structure that has an outward curves or a series of outward curves. Delzeit alternately teaches that the catalyst structure can be in the shape of a ring with multiple outward curves (wavelike) structure (fig 2G, col 4, lines 39-41). Thus all limitations of the claims are well taught by Delzeit (**claims 1 and 7**).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. **Claims 1-5 and 7** are rejected under 35 U.S.C. 103(a) as being unpatentable over Delzeit (US 6858197).

Delzeit further teaches that a catalyst structure having a multilayer catalyst material with a first catalytic layer of iron, cobalt, or nickel covered by a second layer of catalytic molybdenum (**claim 5**), can then be coated with an overlayer material (which puts it on the top side of the catalyst structure) of silver (**claims 3 and 4**). This overlayer material is not taught to be catalytic and does not appear to contribute to catalysis, instead having the function of coating the outside of the grown nanotubes (col 4 line 57 through col 5, line 3). Additionally, since applicant claims that silver can be the non-catalytic material, it must have "substantially no catalytic activity with respect to a growth of said crystalline carbon" (**claim 2**).

Regarding the shape of the pattern, Delzeit further teaches that the structure can be patterned in the shape of the number "8" which is a columnar body with a ring (fig 2G, col 4, lines 23-41).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to create the multilayer molybdenum catalyst layer with the silver non-catalytic layer on the top side of the structure in the shape of a columnar ring, since these materials are explicitly taught to be suitable for the catalyst material and the columnar ring shape is explicitly taught to be a suitable shape for the catalyst material (**claim 1**).

6. Regarding **claim 7**, according to dictionary.com "wavelike" is defined to mean "an outward curve, or one of a series of such curves, in a surface or line; undulation." Thus a wavelike ring is a ring structure that has an outward curves or a series of outward curves. Delzeit alternately teaches that the catalyst structure can be in the

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shape of a ring with multiple outward curves (wavelike) structure (fig 2G, col 4, lines 23-41). Thus from Delzeit it is readily apparent to produce a catalyst structure which is in the shape of a wavelike ring (**claim 7**).

7. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Delzeit (US 6858197) in view of Fan et al (Science vol 283, pages 512-514, (1999)).

The instant claim requires that the crystal growth surface of the catalyst be oxidized.

Delzeit teaches using iron as the nanotube catalyst (abstract), but does not teach oxidizing its surface.

However, Fan et al is also directed towards patterning and vapor deposition of carbon nanotubes (abstract) by selective deposition of iron as a catalyst material, which then has its surface oxidized (page 512, col 2, lines 1-10). Fan et al further teaches that the resulting iron oxide material acts as a suitable catalyst to decompose precursor vapors so that they then form carbon nanotubes (page 513, col 1, lines 1-5).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to substitute the iron catalyst of Delzeit with the iron oxide catalyst of Fan as a known alternative catalyst material known to be suitable for the deposition of carbon nanotubes which would produce predictable results (**claim 6**).

Conclusion

8. No current claims are allowed.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792